## **CLAIMS**

What is claimed is:

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1. A composition comprising an effective amount of a peptidic compound comprising a moiety which is phosphorylated, or which is capable of being phosphorylated, and a pharmaceutically acceptable excipient, wherein the compound is effective in reducing a serum phosphate level in an individual.

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- 2. The composition of claim 1, wherein said peptidic compound comprises monomer units selected from the group consisting of:
- (a) a unit (I) selected from the group consisting of a coded amino acid, a non-coded amino acid, and a synthetic amino acid, of the general structural formula (I'):

$$\begin{array}{c}
 & \stackrel{+}{NH_3} \\
 -OOC - \stackrel{|}{C} -R_1 \\
 & \stackrel{|}{H}
\end{array}$$

wherein R<sub>1</sub> is any moiety connectable to the carbon atom; and

(b) a unit (II) selected from the group consisting of a coded amino acid, a non-coded amino acid, and a synthetic amino acid, of the general structural formula:

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wherein  $R_2$  is any moiety which is phosphorylated or which is capable of being phosphorylated, wherein n=0 to 10.

- 3. The composition of claim 2, wherein  $R_1$  is a side chain of an amino acid selected from the group consisting of glycine, alanine, valine, leucine, isoleucine, phenylalanine, serine, threonine, tyrosine, aspartic acid, and glutamic acid.
  - 4. The composition of claim 2, wherein  $R_1$  is -H.
- 5. The composition of claim 2, wherein R<sub>2</sub> of each monomer unit is independently selected from the group consisting of -CH<sub>2</sub>OX, -CH(OX)-CH<sub>3</sub>, -CH<sub>2</sub>(phenyl)-OX, wherein X is H,

- 6. The composition of claim 2, wherein units I and II are in alternating positions  $(I-II)_m$ , wherein m is an integer from 1 to 7.
- 7. The composition of claim 6, wherein the peptidic compound comprises about 7 covalently linked groups of alternating units of glycine and serine.
  - 8. The composition of claim 6, wherein one or more of the serines is phosphorylated.
- 9. The composition of claim 1, wherein the compound increases bone phosphorus content in an individual.

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- 10. A method of reducing a phosphate level in the serum of an individual, comprising administering to an individual in need thereof an effective amount of a composition comprising a pharmaceutically acceptable excipient and an effective amount of a compound comprising monomer units selected from the group consisting of:
- (a) a unit (I) selected from the group consisting of a coded amino acid, a non-coded amino acid, and a synthetic amino acid, of the general structural formula (I'):

$$\begin{array}{c}
+\\
NH_{3}\\
-OOC - \begin{vmatrix} \\ C \end{vmatrix} - R_{1}\\
\\
H
\end{array}$$

wherein R<sub>1</sub> is any moiety connectable to the carbon atom; and

(b) a unit (II) selected from the group consisting of a coded amino acid, a non-coded amino acid, and a synthetic amino acid, of the general structural formula:

$$\begin{array}{c}
+\\NH_{3}\\
-OOC - \mid\\C\\-(CH_{2})_{n}-R_{2}\\
\mid\\H
\end{array}$$

, wherein said compound comprises a moiety which is phosphorylated or which is capable of being phosphorylated, and wherein the composition reduces a serum phosphate level in the individual.

- 11. The method of claim 10, further comprising reducing bone loss in an individual.
- 12. A method of treating hyperphosphatemia, comprising:

administering to an individual a therapeutically effective amount of a composition comprising a pharmaceutically acceptable excipient and a peptidic compound characterized by (a) oral bioavailability, (b) 4 to 30 residues, and (c) having at least one residue which is phosphorylated

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or which is phosphorylatable in vivo or in vitro.

- 13. The method of claim 12, wherein the composition comprises 1 to 1,000 mg of the peptidic compound.
  - 14. The method of claim 12, wherein the individual is a mammal.
- 15. The method of claim 14, wherein the peptidic compound is further characterized by reducing serum phosphate levels 5% or more in the mammal.
- 16. The method of claim 12, further comprising: repeatedly administering the composition once a day or more over a period of 30 days or more.
- 17. A method of increasing incorporation of phosphorus into bone in an individual, comprising administering to the individual a therapeutically effective amount of a composition comprising a pharmaceutically acceptable excipient and a peptidic compound characterized by (a) oral bioavailability, (b) 4 to 30 residues, and (c) having at least one residue which is phosphorylated or which is phosphorylatable *in vivo* or *in vitro*.
- 18. A method of increasing bone strength in an individual, comprising administering to the individual a therapeutically effective amount of a composition comprising a pharmaceutically acceptable excipient and a peptidic compound characterized by (a) oral bioavailability, (b) 4 to 30 residues, and (c) having at least one residue which is phosphorylated or which is phosphorylatable in vivo or in vitro.
- 19. A method of treating a bone disease in an individual, wherein the bone disease is characterized by reduced bone phosphorus content, the method comprising administering to the individual a therapeutically effective amount of a composition comprising a pharmaceutically

acceptable excipient and a peptidic compound characterized by (a) oral bioavailability, (b) 4 to 30 residues, and (c) having at least one residue which is phosphorylated or which is phosphorylatable in vivo or in vitro.